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LITIGATION TECHNICAL SUPPORT AND SERVICES

ROCKY MOUNTAIN ARSENAL

DUPLICATE

FINAL PHASE I
CONTAMINATION ASSESSMENT REPORT
SECTION 27: NONSOURCE AREA
(Version 3.1)

December 1987
Contract Number DAAK11-84-D0016
Task Number 14 (Army Sites North)

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

HARDING LAWSON ASSOCIATES MIDWEST RESEARCH INSTITUTE

PREPARED FOR

PROGRAM MANAGER'S OFFICE FOR

ROCKY MOUNTAIN ARSENAL CLEANUP

ERRATA

SECTION 27 - NONSOURCE AREA

FINAL TASK 14, PHASE I CAR (Version 3.1)

p. 7 Section 2.0, references:

The dates have been added for the following references:

Davis, 1985

McNeill, 1985

Trautmann, 1985

Way, 1985

Witt, 1985

p. 8 Section 2.0, 1975 aerial photograph description:

"Scars 27-1 and 27-2" has been substituted for "Scars 27-1 and 27-2".

p. 24 Section 4.0 references:

The dates have been added for the following references:

Davis, 1985

McNeill, 1985

Trautmann, 1985

Way, 1985

Witt, 1985

LITIGATION TECHNICAL SUPPORT AND SERVICES

Rocky Mountain Arsenal

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PREPARED BY

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

Harding Lawson Associates Midwest Research Institute
(Prepared under Task 21)

PREPARED FOR

U.S. ARMY PROGRAM MANAGER'S OFFICE FOR ROCKY MOUNTAIN ARSENAL

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13. ABSTRACT *(Maximum 200 words)*

THIS FINAL REPORT DOCUMENTS THE PHASE I CONTAMINATION SURVEY OF SECTION 27 UNCONTAMINATED. INCLUDED IN THIS SECTION ARE SITES 27-1 (BASIN G) AND 27-2 AND 27-3 (BOTH GROUND SCARS).

28 COMPOSITE SAMPLES FROM 28 BORINGS WERE ANALYZED FOR SEMIVOLATILE ORGANICS AND METALS WITH SEPARATE ANALYSES FOR HG AND AS. ONLY 1 SAMPLE HAD A TARGET COMPOUND, AS, WITH A CONCENTRATION ABOVE THE INDICATOR RANGE. HOWEVER, THIS AS CONCENTRATION IS NOT CONSIDERED INDICATIVE OF DISPOSAL ACTIVITY.

ON THE BASIS OF PHASE I RESULTS, HISTORICAL DOCUMENTATION, AND AERIAL PHOTOGRAPHS, NO PHASE II PROGRAM IS RECOMMENDED.

APPENDICES: CHEMICAL NAMES, PHASE I CHEMICAL DATA, COMMENTS AND RESPONSES.

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EXECUTIVE SUMMARY

SECTION 27: NONSOURCE AREA

Section 27-UNC, which forms part of the northwest boundary of Rocky Mountain Arsenal (RMA), has historically been a buffer zone. A Phase I program was conducted under Task 14 in the summer of 1986 to support the status of this section as a nonsource area. Twenty-eight borings were drilled to 5 feet (ft), each yielding a composite sample from the 0- to 1- and 4- to 5-ft intervals. A geophysical survey was not performed, because historical evidence indicated that Section 27-UNC was not used for disposal activities. Two small ground scars (27-2 and 27-3) and Basin G (27-1), which are located along the eastern boundary of section, were investigated by Borings 5409, 5408, and 5407, respectively.

The Phase I program confirmed the status of Section 27-UNC as a nonsource area. Target organic compounds were not detected in any sample, including those from the ground scar areas. Metal concentrations were within or below indicator ranges, except for one 12 parts per million (ppm) arsenic value from Borehole 5182, located near the northwest section corner. Cadmium and mercury were not detected in any sample. Nontarget organic compounds generally consisted of phthalates and propanoic acids at low concentrations (<4 ppm). The presence of these compounds is not thought to be a result of waste disposal activities.

Historical evidence, aerial photographs, and Phase I results support the assumption that Section 27-UNC is a nonsource area. The single elevated arsenic concentration is not considered to be indicative of contamination, as historical evidence, aerial photograph descriptions, and a database search show no evidence of disposal activities.

SECTION 27: NONSOURCE AREA

1.0 PHYSICAL SETTING

1.1 LOCATION

Section 27-UNC forms part of the northwest Rocky Mountain Arsenal (RMA) boundary (Figure 27-UNC-1) and covers an area of 27,570,000 square feet (ft^2). Except for the extreme northwest corner, Section 27 is within RMA boundaries. Section 27 is bounded by "B" Street on the west, "C" Street on the east, Eighth Avenue on the south, and Nineth Avenue to the north. Burlington-Northern Railroad tracks form the northwest boundary of Section 27.

Interpretation of aerial photographs and RMA site maps resulted in the identification of two ground disturbances (27-2 and 27-3) that were not designated as potential sites by Rocky Mountain Arsenal Contamination Control Program Management Team (RMACCPMT, 1984, RIC#84034R01) (Figure 27-UNC-1). Basin G (27-1), a small natural depression within Section 27, was also never used or officially designated as a basin. These sites were subsequently included in this Phase I investigation.

1.2 GEOLOGY

Section 27 is situated in Pleistocene alluvium which consists of interbedded silty sand, gravel, and clay partly covered by a thin layer of eolian sand and silt. The alluvial thickness varies from approximately 70 feet (ft) in the north-central part of the section to 20 ft in the east-central part of the section (Clark, 1985, RIC#85183R01).

The alluvium is underlain by the Denver Formation which is characterized by bentonite-rich clay/shale with compact lenticular sand horizons. Lithologic variations within the Denver Formation include interbedded siltstone, claystone, sandstone, low-grade coal, lignite, and volcaniclastic material (May, 1982, RIC#82295R01; RMACCPMT, 1983, RIC#83326R01; Anderson et al., 1979, RIC#85214R03; Clark, 1985, RIC#85183R01).

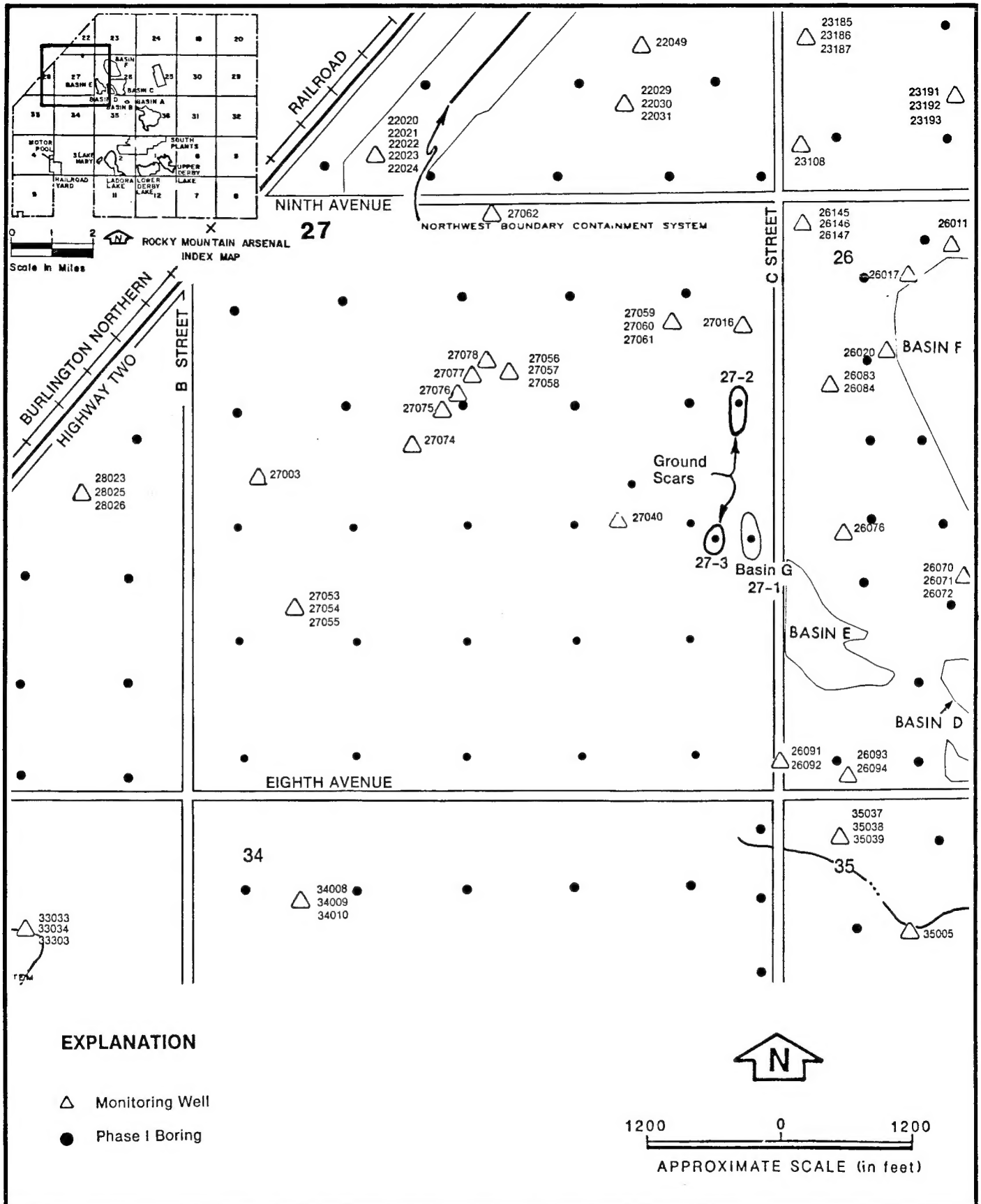


Figure 27-UNC-1
SITE LOCATION MAP
SECTION 27- UNC
ROCKY MOUNTAIN ARSENAL
SOURCE: ESE, 1987

Prepared for:
U.S. Army Program Manager's Office
For Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

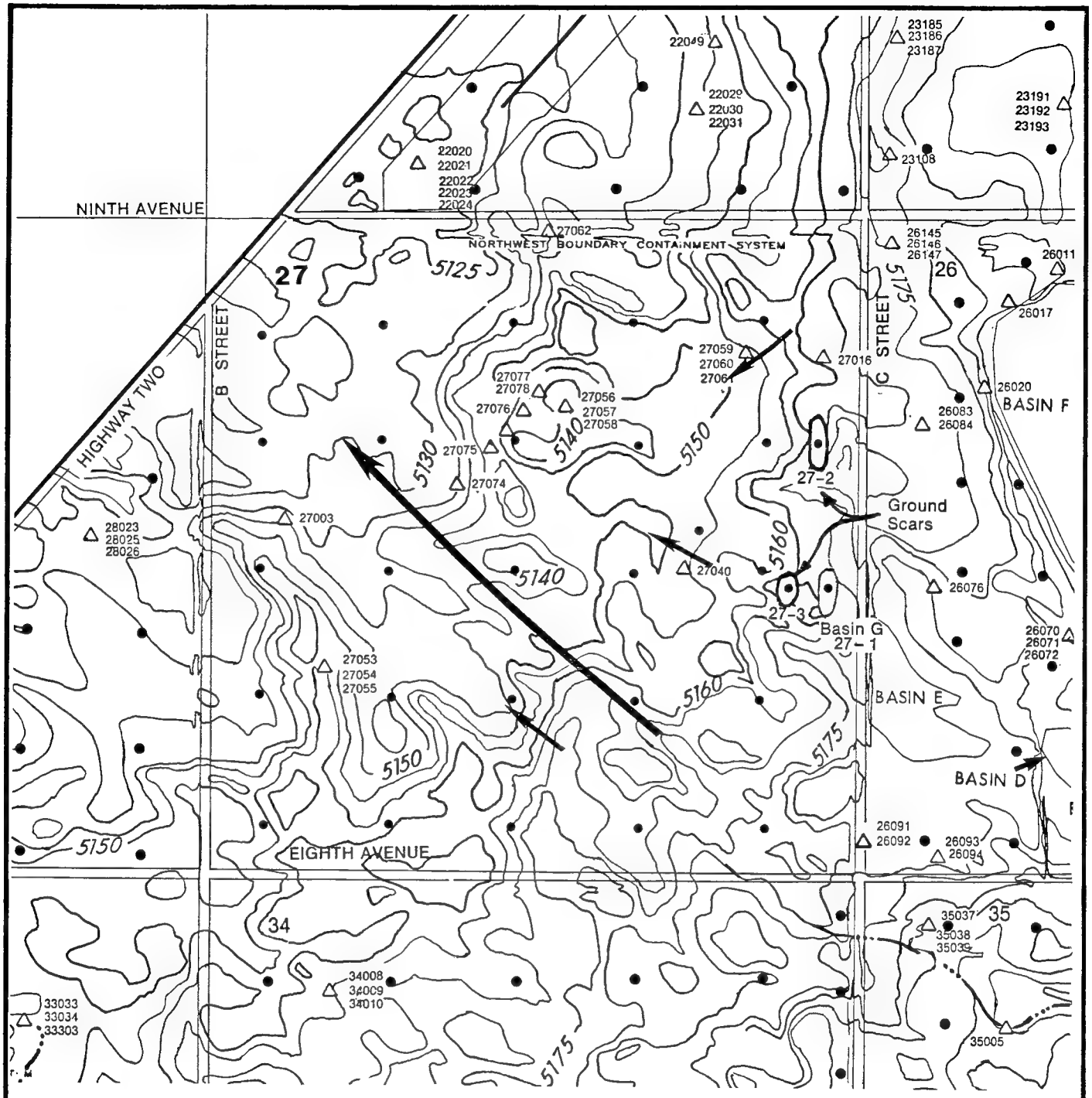
The 28 Phase I borings were drilled through the upper 5 ft of alluvium, which consists of silty sand and sandy silt. Bedrock was not encountered in any boring.

1.3 HYDROLOGY

The ground surface in Section 27 generally slopes to the northwest. Surface elevations vary from approximately 5,180 feet above mean sea level (ft msl) in the southeast corner of Section 27 to 5,120 ft msl in the northwest corner. Surface drainage generally flows northwest (Figure 27-UNC-2). Although no streams are in this section, numerous small, natural depressions, which temporarily hold water following a heavy rain or snow melt, are visible.

Ground water was not encountered in any Phase I boring. Depth to water in monitor wells within this section ranges from 20 to 35 ft. The ground water contour map of Section 27 (Figure 27-UNC-3) generated from data collected in March 1986, shows that the water-table elevation varies from 5,160 to 5,094 ft msl. Flow direction varies from almost due west in the eastern half of the section to north-northwest in the western half. The water table is above the alluvium-Denver Formation contact throughout most of Section 27 (May, 1982, RIC#82295R01; RMACCPMT, 1983, RIC#83326R01; RMACCPMT, 1984, RIC#84034R01; Spain et al., 1984, RIC#85133R01; Clark, 1985 RIC#85183R01).

Ground water quality was tested in monitor wells in Section 27 as part of the Task 4 Initial Screening Program (ESE, 1986c, RIC#86238R08). Although various contaminants were detected in the 12 wells in Section 27 (Table 27-UNC-1), such compounds represent a class of chemicals typically found in the ground water beneath Basin F (upgradient of Section 27). The presence of these organic constituents in Section 27 ground water does not imply that this is contributing to contamination in these wells.



EXPLANATION

- Creek
- Monitoring Well
- Phase I Boring
- Dominant Surface Drainage Flow
- Subordinate Surface Drainage Flow

N

1200 0 1200

APPROXIMATE SCALE (in feet)

Contour Interval 5 Feet

Figure 27-UNC-2
REGIONAL TOPOGRAPHY
SECTION 27-UNC
ROCKY MOUNTAIN ARSENAL
SOURCE: ESE, 1987

Prepared for:
U.S. Army Program Manager's Office
For Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

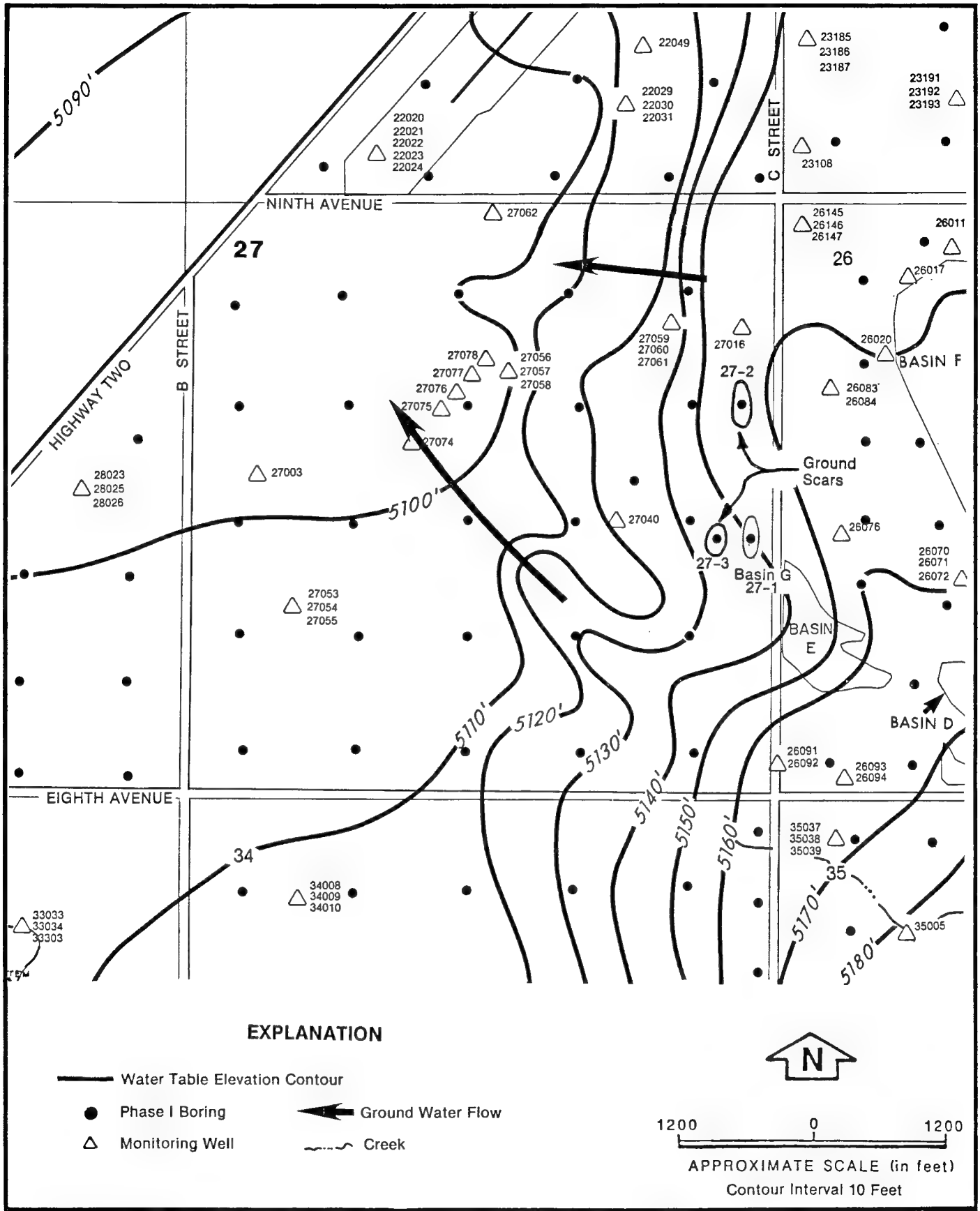


Figure 27-UNC-3
REGIONAL GROUND WATER FLOW
SECTION 27-UNC
ROCKY MOUNTAIN ARSENAL
SOURCE: ESE, 1987

Prepared for:
U.S. Army Program Manager's Office
For Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

Table 27-UNC-1. Task 4 Ground Water Monitoring Well Results

Well Number	27016	27040	27053	27054	27055	27056	27062	27074	27075	27076	27077	27078	Detection Level
	(Concentration µg/l)												
Analytes													
Dieldrin	0.6	0.1				0.3	0.06	0.2	1.0	0.1	0.2	0.1	0.06
Dichlorodiphenyltrichloroethane		0.1								0.07	0.07		0.07
Diisopropylmethyl phosphonate		75				15	40						10
1,2-Dichloroethane		4.9								1.4	1.7		0.61
Trichloroethene		9.9			1.7		1.5		1.2	2.1	3.9		1.1
Dibromochloropropane		0.42					0.28						0.13
Methylene chloride			6.0	7.0									5.0
Toluene				1.26									1.21
Benzene				2.47									1.34
Chloroform							11.2	70.0	29.9	15.3	7.18		1.4
Isodrin										0.08			0.06

Source: ESE, 1986c, RIC#86238R08

2.0 HISTORY

Section 27 served as a buffer zone for RMA. Aerial photographs from 1948 delineate two ground scars (27-2, 27-3) and a natural basin, designated as "G". The ground scars may possibly have been borrow areas used in constructing the dikes on Basins D and E (Way, ~~no date~~ 1985). Basin G was never intended for waste disposal, and no dikes were constructed; it was a low-lying slough that collected water after rainfall (Witt, ~~no date~~ 1985; Trautmann, ~~no date~~ 1985). It is possible, given its close proximity to Basin E, that Basin G received waste overflow from the South Plants area in the 1940's, as well as Basin A overflow after 1946 (Davis, ~~no date~~ 1985; McNeill, ~~no date~~ 1985; Geraghty and Miller, 1982, RIC#82235R03). Both Basin G and the two ground scars are near the eastern section boundary.

Aerial photographs for Section 27 (RMA, 1975, RIC#84062P01; RMA, 1976, RIC#81353P07; RMA, 1980, RIC#83080P02; Stout et al., 1982, RIC#83368R01; Intrasearch, 1984, RIC#85121P08; ITECH, 1985, RIC#86314P01) may be summarized as follows:

Photograph Date	Description
June 12, 1948	This photograph covers only the eastern edge of Section 27. Part of Basin G (27-1) can be seen. A small east-west dike structure is east of Site 27-1 in Section 26.
October 15, 1964	The east-west dike structure has been removed. A much larger, 1,300-ft-long, north-south dike has been built on the east side of C Street. Basin E is now present, but it is dry. Basin G (27-1) is clearly defined within a rectangular area. Ground scars 27-2 and 27-3 are visible.
April 25, 1970	Approximately 15 light spots are visible on the photograph in the central portion of Section 27. These light-colored areas are generally circular and as much as 50 ft in diameter. Variations in vegetative composition appear to be associated with these light-colored areas. Another light-colored circular area approximately 150 ft in diameter

	is in the center of the northeast quadrant. Basin G (27-1) appears dry and covered by vegetation. Scars 27-2 and 27-3 are not as well defined as they were in 1964. Basin E contains liquid.
1976	Liquid can be seen in Basins G and E on this oblique aerial photograph .
June 25, 1975	Scars 27-1 and 27-2 and the light-colored circular areas are visible. Basin G has a bare patch near its center
September 20, 1980	This photograph covers the eastern portion of Section 27. No changes since previous photograph.
July 16, 1984	Scars 27-1 and 27-2 are still visible, but have revegetated naturally. The light-colored circular areas and the bare patch in Basin G are still apparent.
June 12, 1985	No changes from previous photograph, except the central portion of Basin G is sparsely vegetated.

3.0 SITE INVESTIGATION

3.1 PREVIOUS SOIL INVESTIGATIONS

Soil in Section 27 has been mapped by the U.S. Soil Conservation Service (Sampson and Baber, 1974) as the Ascalon-Vona-Truckton Association. The three major soil series in Section 27 are the Ascalon sandy loam (1- to 3-percent slope), Truckton sandy loam (3- to 9-percent slope), and the Ascalon-Vona sandy loam (1- to 5-percent slope).

Ascalon soil is formed from loamy material and contains varying amounts of sand and gravel. The upper profile is a non-calcareous brown sandy loam to sandy clay loam. Surface runoff is medium, and the water erosion potential is moderate. Ascalon soil is generally well-drained.

Truckton soil is formed from windblown, sandy materials. The upper profile contains noncalcareous, dark-brown to brown sandy loam. Surface runoff is medium, and the potential for water erosion is severe. Truckton soil is well-drained to excessively drained. No previous soil contamination studies were conducted at this section.

3.2 PHASE I SURVEY

3.2.1 Phase I Program

The Phase I Boring Program investigated the alluvium at 28 locations (Figure 27-UNC-4) to confirm that Section 27 is a nonsource area. A 1,000-ft borehole spacing was selected for this section on the basis of historical information. Borings 5407, 5408, and 5409 were drilled to investigate Basin G (27-1) and the ground scars (27-3 and 27-2), respectively. All borings were drilled to a 5-ft depth using the continuous soil sampling technique detailed in the Task 14 Technical Plan (ESE, 1986b, RIC#86238R04). Samples were composited in the laboratory from the 0- to 1- and 4- to 5-ft intervals unless field conditions [i.e., water table, staining, etc.] required an adjustment in procedures. None of the 28 Phase I soil borings penetrated the water table or the Denver Formation, and all samples were from predetermined intervals.

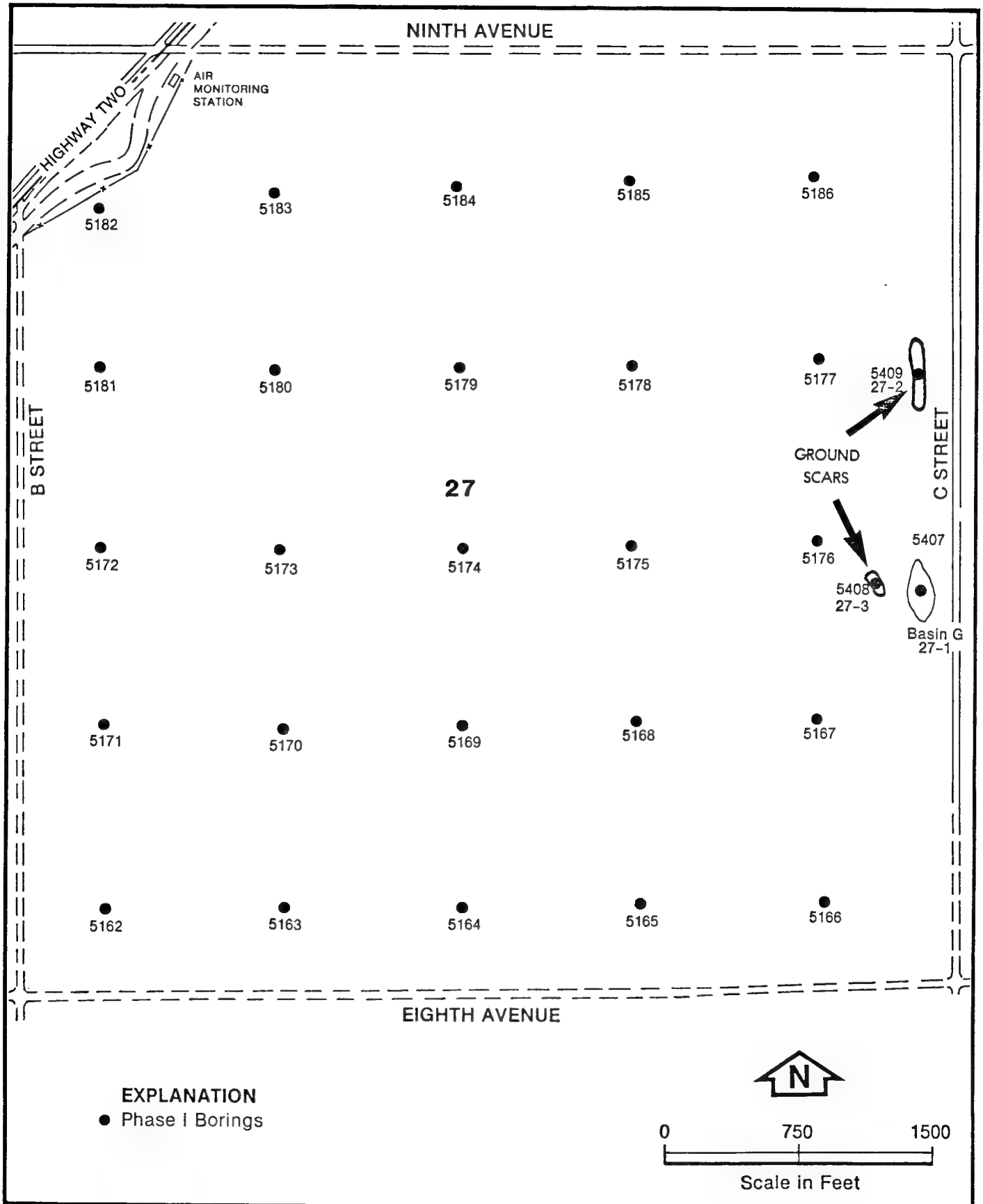


Figure 27-UNC-4
PHASE I INVESTIGATION
BORING LOCATION MAP
SECTION 27-UNC
SOURCE: ESE, 1987

Prepared for:
U.S. Army Program Manager's Office
For Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

Prior to drilling, all boring sites were cleared for safety purposes in accordance with the geophysical program detailed in the Task 14 Technical Plan (ESE, 1986c, RIC#86238R04). A metal detector was used at all boring locations to survey the area for significant amounts of metal debris. If the metal detector indicated debris, the borehole clearance program would have been expanded to include a gradiometer survey. Significant metal debris was not detected at this site, and no boring locations were moved as a result of the geophysical program. Boring locations, pertinent surficial objects, and historical features from aerial photographs are presented on the boring location map (Figure 27-UNC-4).

A photoionization detector (PID), calibrated to an isobutylene standard, was used to obtain readings from open boreholes during drilling and from soil samples during geologic logging. The PID measures the concentration of organic vapors in the air and is a method of ensuring personnel safety.

The Phase I remedial investigation program for this section was developed and implemented based on historical documentation, aerial photographs, and other information available at the time of its implementation. Since that time, previously unavailable information has been identified through the efforts of Acumenics, a contractor to the Department of Justice. This more recently available information has been incorporated into the history section of this report. Furthermore, this additional information has been evaluated in detail to determine how it might impact the investigation approach at this section. Based upon this evaluation, it has been determined that the additional information collected since the Phase I program was designed does not substantially alter the status of this section as a nonsource area. As a result, the Phase I program as conducted is judged to provide a complete and accurate investigation of this nonsource area.

All samples were analyzed by gas chromatography/mass spectrometry (GC/MS) for semivolatile organic compounds and by inductively coupled argon plasma (ICP) analyses for cadmium, chromium, copper, lead, and zinc. All samples

were analyzed for arsenic and mercury by atomic absorption (AA) spectroscopy. A GC/MS volatile organic analysis was not performed on samples from nonsource areas.

3.2.2 Phase I Field Observations

Field observations revealed Section 27 to be essentially undisturbed. No surface discolorations were noted at the ground scar locations or light areas described in the aerial photographs, and no visual contamination was noted in any Section 27-UNC boring. No unusual soil coloration was observed in Basin G, and Boring 5407 (drilled in the low, bare spot of Basin G) did not indicate any evidence of contamination. PID readings were at background levels during drilling at this site.

Historical evidence did not indicate the potential for the presence of chemical agents in this section. An M8 alarm was used, however, as a safety precaution to detect the presence of chemical agents in boreholes and soil samples. The M8 alarm is used to detect Sarin (GB) and VX at detection levels of 0.2 and 0.4 milligrams per cubic meter (mg/m^3), respectively, after a response time of 2 to 3 minutes (USAMDARC, 1982; USAMDARC, 1979). However, other substances including smoke and engine exhaust can activate the M8 alarm. No alarm activation occurred at this site.

3.2.3 Geophysical Exploration

A comprehensive surface geophysical program was not performed in Section 27, because historical information indicated that this section is a nonsource area, and there was no evidence of buried metal, trenches, or disposal pits.

3.2.4 Phase I Analyte Levels and Distribution

Table 27-UNC-2 contains indicator ranges and a statistical summary of Phase I analytical results. A summary of analytical data for each sample, including lithology and air monitoring results, is presented in Table 27-UNC-3. A listing of the target compounds and a tabulation of analytical data can be found in Appendices 27-UNC-A and 27-UNC-B. To assess the significance of metal and organic analytical values, indicator ranges were established. For organic compounds, the indicator level is the method detection limit. For metals, a range of values was chosen to reflect the

Table 27-UNC-2. Summary of Analytical Results for Section 27-UNC

Constituent	Number of Samples*	Concentrations (µg/g) Range	Mean	Median	Standard Deviation	ESE Detection Limit	MRI Detection Limit	Indicator Range
Volatiles (N=0)†								
Not analyzed								DL
Semivolatiles (N=28)†								
None detected								DL
ICP Metals (N=28)†								
Cadmium	0	--	--	--	--	0.90	0.50	DL -2.0
Chromium	18	8.6-15	11	11	1.8	7.2	7.4	25-40
Copper	28	6.2-32	16	16	5.7	4.8	4.9	20-35
Lead	0	--	--	--	--	17	16	25-40
Zinc	16	33-66	41	38	8.8	16	28	60-80
Arsenic (N=28)†	1	12	--	--	--	4.7	5.2	DL-10
Mercury (N=28)†	0	--	--	--	--	0.050	0.070	DL-0.10

* Number of samples in which constituent was detected above the detection limit.
† N = Number of samples analyzed.
-- Not calculated for less than five detections.
DL Detection Limit.

Source: ESE, 1987.

Table 27-UNC-3. Concentrations of Target Analytes Above Detection Limits in Section 27-UNC Soil Samples (Page 1 of 3)

Bore Number	5162	5163	5164	5165	5166	5167	5168	5169	5170	5171	5172	5173	5174
Depth (ft)	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.	Comp.
Geologic Material	Silty Sand	Silty Sand	Silty Sand/ Sandy Silt	Silty Sand	Silty Sand	Silty Sand	Silty Sand	Sandy Silt	Sandy Silt	Sandy Silt	Silty Sand	Silty Sand	Sandy Silt/ Silty Sand
AIR MONITORING													
PID*	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD
SOIL CHEMISTRY													
Volatiles (µg/g)													
Not analyzed													
Semivolatiles (µg/g)													
None detected													
ICP Metals (µg/g)													
Cadmium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chromium	9.0	BDL	BDL	9.6	11	BDL	11	14	11	11	BDL	9.4	10
Copper	16	16	14	18	19	15	24	23	18	20	11	18	19
Lead	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zinc	BDL	BDL	BDL	BDL	35	BDL	34	45	38	39	BDL	34	34
Arsenic (µg/g)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Mercury (µg/g)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Table 27-UNC-3. Concentrations of Target Analytes Above Detection Limits in Section 27-UNC Soil Samples (Page 2 of 3)

Bore Number Depth (ft) Geologic Material	5175 Comp. Sandy Silt	5176 Comp. Silty Sand	5177 Comp. Sandy Silt	5178 Comp. Sandy Silt	5179 Comp. Silty Sand	5180 Comp. Sandy Silt	5181 Comp. Sandy Silt	5182 Comp. Sandy Silt	5183 Comp. Sandy Silt	5184 Comp. Sandy Silt
AIR MONITORING										
PID*	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD
SOIL CHEMISTRY										
Volatiles (µg/g)										
Not analyzed										
Semivolatiles (µg/g)										
None Detected										
ICP Metals (µg/g)										
Cadmium	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chromium	12	8.6	13	15	BDL	BDL	11	11	9.9	11
Copper	20	18	21	20	14	6.2	14	32	14	16
Lead	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Zinc	38	BDL	42	38	BDL	39	53	66	45	50
Arsenic (µg/g)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	12	BDL	BDL
Mercury (µg/g)	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Table 27-UNC-3. Concentrations of Target Analytes Above Detection Limits in Section 27-UNC Soil Samples (Page 1 of 1)

Bore Number	5185	5186	5407	5408	5409
Depth (ft)	Comp.	Comp.	Comp.	Comp.	Comp.
Geologic Material	Silty Sand/ Sandy Silt	Sandy Silt/ Silty Sand	Silty Sand	Silty Sand	Silty Sand
AIR MONITORING					
PID*	BKD	BKD	BKD	BKD	BKD
SOIL CHEMISTRY					
Volatiles (µg/g)					
Not analyzed					
Semivolatiles (µg/g)					
None Detected					
ICP Metals (µg/g)					
Cadmium	BDL	BDL	BDL	BDL	BDL
Chromium	BDL	8.6	BDL	BDL	BDL
Copper	14	12	7.1	7.3	8.0
Lead	BDL	BDL	BDL	BDL	BDL
Zinc	33	BDL	BDL	BDL	BDL
Arsenic (µg/g)	BDL	BDL	BDL	BDL	BDL
Mercury (µg/g)	BDL	BDL	BDL	BDL	BDL

* Calibrated to isobutylene standard.
BDL Below detection limit.
BKD No readings above ambient background.
NA Not analyzed.
Comp. Composited samples from the 0- to 1- and 4- to 5-ft intervals.

Source: ESE, 1987.

upper end of the expected natural range for each metal as normally found in RMA alluvial soil. The procedure for establishing indicator ranges is presented in the Introduction to the Contamination Assessment Reports (ESE, 1986a). Indicator ranges for each metal are shown in Table 27-UNC-2. Concentrations within or above indicator ranges for Phase I data are presented in Figure 27-UNC-5.

Phase I chemical results confirm that Section 27 is a nonsource area (Table 27-UNC-3). Boring 5182, the only boring with a compound above its indicator range, contained arsenic at 12 parts per million (ppm), which is slightly above the indicator range. This sample also contained copper and zinc concentrations of 32 and 66 ppm, respectively; however, both values are within their indicator ranges. Cadmium, mercury, lead, and target semivolatile organic compounds were not detected in any of the 28 samples.

Several compounds were detected by GC/MS that were not included in the target compound list and that were not conclusively identified. Table 27-UNC-4 lists the boring number, sample interval depth, relative retention time (shown as "unknown number on the table), concentration, sample number, lot, best fit identification, and comments for these nontarget compounds detected at Section 27-UNC. It should be noted that an individual compound may have more than one relative retention time and that a particular retention time may be assigned to more than one compound. Therefore, Table 20-UNC-4 provides only a general indication of additional compounds that may be present.

Nontarget compounds were detected in 21 of 28 borings in concentrations ranging from 0.3 to 4 ppm. Most of these compounds were tentatively identified as plasticizers, substituted propanoic acid, or unknown hydrocarbons at low concentrations.

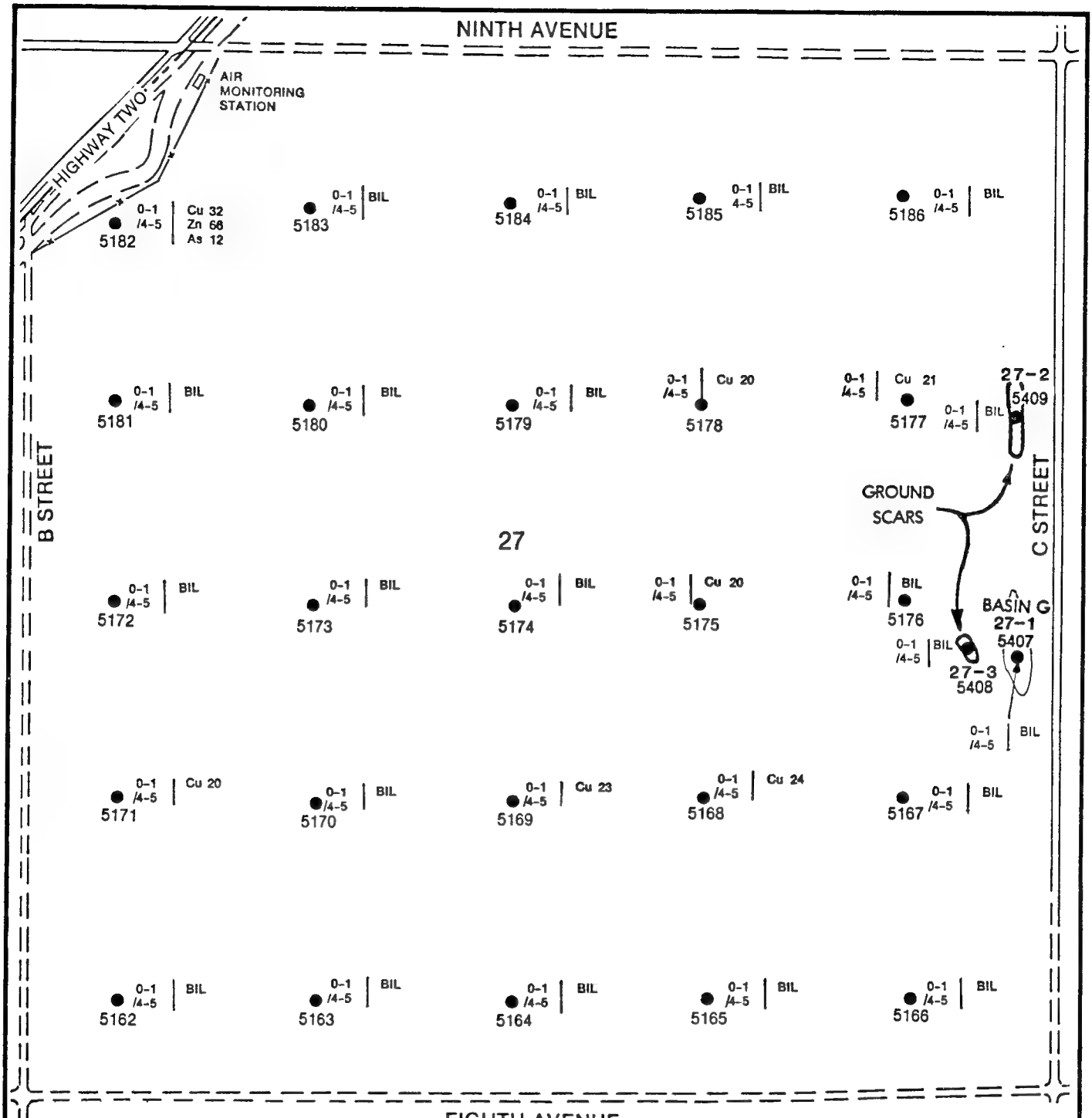


Figure 27-UNC-5
PHASE I INVESTIGATION
CHEMICAL ANALYSIS RESULTS
SECTION 27-UNC
SOURCE: ESE, 1987

Prepared for:
U.S. Army Program Manager's Office
For Rocky Mountain Arsenal
Aberdeen Proving Ground, Maryland

Table 27-UNC-4. Tentative Identification of Nontarget Compounds in Section 27-UNC Soil Samples (Page 1 of 3)

Borehole Number	Interval Depth (ft)	Unknown Number	Concentration Above Background (ppm)*	Sample Number	Lot	Best Fit	Comments†
5162	Comp.	604	4	UN27-1	MJO	Dibutyl phthalate	c
		609	1		MJO	Phthalate	a,c
		632	1		MJO	Unknown hydrocarbon	a,g
5163	Comp.	632	0.7	UN27-2	MJO	Unknown hydrocarbon	a,f
5164	Comp.	573	0.3	UN27-3	MJO	Subst. propanoic	a,f
		574	0.5		MJO	Subst. propanic acid	a,f
		632	0.4		MJO	Unknown hydrocarbon	a,f
5165	Comp.	632	0.7	UN27-4	MJO	Unknown hydrocarbon	a,f
5166	Comp.	573	0.3	UN27-5	MJO	Subst. propanic acid	a,f
		574	0.5		MJO	Subst. propanic acid	a,f
		632	0.6		MJO	Unknown hydrocarbon	a,f,g
5167	Comp.	573	0.8	UN27-6	MJO	Subst. propanic acid	a,f
		574	1		MJO	Subst. propanic acid	a,f
		628	0.6		MJO	(Dioctyl adipate) subst. hexadecanoic acid	c,f
		632	0.4		MJO	Unknown hydrocarbon	a,f
5168	Comp.	573	0.8	UN27-7	MJO	Subst. propanic acid	a,f
		574	1		MJO	Subst. propanic acid	a,f
		632	0.6		MJO	Unknown hydrocarbon	a,f
5169	Comp.	573	0.7	UN27-8	MJO	Subst. propanic acid	a,f
		574	1		MJO	Subst. propanic acid	a,f
		628	0.6		MJO	(Dioctyl adipate) subst. hexadecanoic acid	c,f
		632	0.6		MJO	Unknown hydrocarbon	a,f

Table 27-UNC-4. Tentative Identification of Nontarget Compounds in Section 27-UNC Soil Samples (Page 2 of 3)

Borehole Number	Interval Depth (ft)	Unknown Number	Concentration Above Background (ppm)*	Sample Number	Lot	Best Fit	Comments†
5170	Comp.	614	0.4	UN27-9	MJP	Subst. nonanedioic	a,f
		632	0.5			Unknown hydrocarbon	a,f
5171	Comp.	632	0.7	UN27-10	MJP	Unknown hydrocarbon	a,f
5172	Comp.	632	0.8	UN27-11	MJP	Unknown hydrocarbon	a,f
		635	0.4			Dioctyl phthalate	c,f
5173	Comp.	632	1	UN27-12	MJP	Unknown hydrocarbon	a,f
5174	Comp.	62[illegible]	4	UN27-13	MJP	Dioctyl adipate	c
		632	0.8			Unknown hydrocarbon	a,f
5175	Comp.	632	0.8	UN27-14	MJP	Unknown hydrocarbon	a,f
5176	Comp.	632	1	UN27-15	MJP	Unknown hydrocarbon	a,f
5177	Comp.			UN27-16	MJP		i
5178	Comp.			UN27-17	MJP		i
5179	Comp.			UN27-18	MJP		j
5180	Comp.	632	0.3	UN27-19	MJQ	Unknown hydrocarbon	a,f
5181	Comp.	632	0.5	UN27-20	MJQ	Unknown hydrocarbon	a,f
5182	Comp.			UN27-21	MJQ		i
5183	Comp.	629	2	UN27-22	MJQ	Subst. hexanoic acid	d
5184	Comp.	632	0.3	UN27-23	MJQ	Unknown hydrocarbon	a,f

Table 27-UNC-4. Tentative Identification of Nontarget Compounds in Section 27-UNC Soil Samples. (Page 3 of 3)

Borehole Number	Interval Depth (ft)	Unknown Number	Concentration Above Background (ppm)*	Sample Number	Lot	Best Fit	Comments†
5185	Comp.	635	1	UN27-24	MJR	Subst. phthalate	a,c,f
		650	1		MJR	Subst. phthalate	a,c,f
		651	0.6		MJR	Subst. phthalate	a,c,f
		652	0.9		MJR	Subst. phthalate	a,c,f
5186	Comp.			UN27-25	MJR		j
5407	Comp.	614	0.9	UN27-26	MTD	Dibutyl nonanedioate	d
		633	2		MTD	Unknown hydrocarbon	a
		636	0.5		MTD	Bis (2-ethyl-hexyl) phthalate	c
5408	Comp.			UN27-27	MTD		i
5409	Comp.			UN27-28	MTD		i

* Values reported are blank corrected.

† a. No positive identification.
b. Surfactant.
c. Plasticizer (note: All phthalates and adipates will have this comment).
d. Derived from natural products.
e. Suspected laboratory contaminant.
f. Low concentration.
g. Low frequency of occurrence.
h. Ubiquitous.
i. Possible column bleed.
j. None detected.

Comp. Composited samples from the 0-1 and 4-5 ft intervals.
Subst. Substituted.

Source: ESE, 1987.

3.2.5 Phase I Contamination Assessment

All but one of the Phase I borings contained metal concentrations within or below their respective indicator ranges. The slightly elevated arsenic concentration in Boring 5182 is considered to be the result of natural geochemical variability and is not thought to indicate contamination. Aerial photographs, historical documentation, and visual observations revealed no evidence of disposal activity. No target semivolatile organic compounds or significant nontarget identifications were detected in the borings. Analytical results confirm that Section 27 is a nonsource area.

The semivolatile GC/MS method applied to all Phase I samples, although not certified for volatile organic compounds, has been shown capable of detecting tetrachloroethylene, chlorobenzene, ethylbenzene, and xylenes in the nontarget fraction at low recovery levels. The absence of these compounds in the nontarget results for this section is an indication that no contamination is present from these compounds.

3.3 PHASE II SURVEY

A Phase II program is not recommended for Section 27, because no target semivolatile compounds were detected and all but one target metal concentration were within or below their respective indicator ranges. A field inspection of the area near Boring 5182 will be conducted to verify that there is no visual evidence of disposal activity.

Comments on the Draft Final Section 27-UNC Contamination Assessment Report were received from Shell Chemical Company on July 1, 1987 and from the U.S. Environmental Protection Agency (EPA) on September 11, 1987. These comments were considered in the preparation of this final report and are presented with responses in Appendix 27-UNC-C. Comments were not received from the Colorado Department of Health prior to the distribution of this report. EPA comments are also an integral part of the review process and have been previously incorporated into this report.

3.4 QUANTITY OF POTENTIALLY CONTAMINATED SOIL

No previous estimates of potentially contaminated soil are available for Section 27-UNC. On the basis of Phase I results, aerial photographs, and historical information, Section 27 is considered to be a nonsource area and free of contamination.

4.0 REFERENCES

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APPENDIX 27-UNC-A
CHEMICAL NAMES, METHODS, AND ABBREVIATIONS

APPENDIX 27-UNC-A
CHEMICAL NAMES, METHODS, AND ABBREVIATIONS

PHASE I ANALYTES AND CERTIFIED METHODS

Analytes/Methods	Synonymous Names and Abbreviations	Standard Abbreviations
VOLATILE ORGANIC COMPOUNDS/GCMS	VOL	VO
1,1-Dichloroethane	1,1-Dichloroethane	11DCLE
1,2-Dichloroethane	1,2-Dichloroethane	12DCLE
1,1,1-Trichloroethane (TCA)	1,1,1-Trichloroethane	111TCE
1,1,2-Trichloroethane	1,1,2-Trichloroethane	112TCE
Benzene	Benzene	C_6H_6
Bicycloheptadiene	Bicycloheptadiene (BCHD)	BCHPD
Carbon tetrachloride	Carbon tetrachloride	CCL_4
Chlorobenzene	Chlorobenzene	CLC_6H_5
Chloroform	Chloroform	$CHCL_3$
Dibromochloropropane	Dibromochloropropane	DBCP
Dicyclopentadiene	Dicyclopentadiene	DCPD
Dimethyldisulfide	Dimethyldisulfide	DMDS
Ethylbenzene	Ethylbenzene	ETC_6H_5
m-Xylene	meta-Xylene	13DMB
Methylene chloride	Methylene chloride	CH_2CL_2
Methylisobutyl ketone	Methylisobutyl ketone	MIBK
o,p-Xylene	ortho- and/or para-Xylene	XYLEN
Tetrachloroethene (PCE)	Tetrachloroethylene	TCLEE
Toluene	Toluene	MEC_6H_5
Trans 1,2-dichloroethene	Trans 1,2-dichloroethylene	12DCE
Trichloroethene (TCE)	Trichloroethylene	TRCLE
SEMIVOLATILE ORGANIC COMPOUNDS/GCMS	EXTRACTABLE ORGANIC COMPOUNDS (EX)	SVO
1,4-Oxathiane	1,4-Oxathiane	OXAT
2,2-Bis (para-chlorophenyl)-1,1-dichloroethane	Dichlorodiphenylethane	PPDDE
2,2-Bis (para-chlorophenyl) 1,1,1-trichloroethane	Dichlorodiphenyltrichloroethane	PPDDT
Aldrin	Aldrin	ALDRN
Atrazine	Atrazine	ATZ
Chlordane	Chlordane	CLDAN
Chlorophenylmethyl sulfide	p-Chlorophenylmethyl sulfide	CPMS
Chlorophenylmethyl sulfoxide	p-Chlorophenylmethyl sulfoxide	CPMSO
Chlorophenylmethyl sulfone	p-Chlorophenylmethyl sulfone	$CPMSO_2$
Dibromochloropropane	Dibromochloropropane	DBCP
Dicyclopentadiene	Dicyclopentadiene	DCPD
Dieldrin	Dieldrin	DLDRN
Diisopropylmethyl phosphonate	Diisopropylmethyl phosphonate	DIMP

APPENDIX 27-UNC-A
CHEMICAL NAMES, METHODS, AND ABBREVIATIONS

Analytes/Methods	Synonymous Names and Abbreviations	Standard Abbreviations
SEMIVOLATILE ORGANIC COMPOUNDS (CONT)		
Dimethylmethyl phosphonate	Dimethylmethyl phosphonate	DMMP
Dithiane	Dithiane	DITH
Endrin	Endrin	ENDRN
Hexachlorocyclopentadiene	Hexachlorocyclopentadiene (HCPD)	CL_6CP
Isodrin	Isodrin	ISODR
Malathion	Malathion	MLTHN
Parathion	Parathion	PRTHN
Supona	2-Chloro-1(2,4-dichlorophenyl) vinyldiethyl phosphate	SUPONA
Vapona	Vapona	DDVP
METALS/ICP	ICAP	ICP
Cadmium	Cadmium	CD
Chromium	Chromium	CR
Copper	Copper	CU
Lead	Lead	PB
Zinc	Zinc	ZN
SEPARATE ANALYSES		
Arsenic/AA	Arsenic	AS
Mercury/AA	Mercury	HG

APPENDIX 27-UNC-A
CHEMICAL NAMES, METHODS, AND ABBREVIATIONS

PHASE II ANALYTES AND CERTIFIED METHODS

Analytes/Methods	Synonymous Names and Abbreviations	Standard Abbreviations
VOLATILE ORGANIC COMPOUNDS/GCMS (Same as Phase I)	VOL	VO
SEMIVOLATILE ORGANIC COMPOUNDS/GCMS (Same as Phase I)	EXTRACTABLE ORGANIC COMPOUNDS (EX)	SVO
VOLATILE HALOCARBON COMPOUNDS/GCCON	PURGEABLE HALOCARBONS (PHC)	VHO
1,1-Dichloroethane	1,1-Dichloroethane	11DCLE
1,2-Dichloroethane	1,2-Dichloroethane	12DCLE
1,1-Dichloroethene	1,1-Dichloroethene	11DCE
1,1,1-Trichloroethane (TCA)	1,1,1-Trichloroethane	111TCE
1,1,2-Trichloroethane	1,1,2-Trichloroethane	112TCE
Carbon tetrachloride	Carbon tetrachloride	CCL_4
Chlorobenzene	Chlorobenzene	CLC_6H_5
Chloroform	Chloroform	$CHCL_3$
Methylene chloride	Methylene chloride	CH_2CL_2
Trans 1,2-dichloroethylene	Trans 1,2-dichloroethene	12DCE
Tetrachloroethene (PCE)	Tetrachloroethylene	TCLEE
Trichloroethene (TCE)	Trichloroethylene	TRCLE
VOLATILE HYDROCARBON COMPOUNDS/GCFID	DCPD	HYDCBN
Bicycloheptadiene	Bicycloheptadiene (BCHD)	BCHPD
Dicyclopentadiene	Dicyclopentadiene	DCPD
Methylisobutyl ketone	Methylisobutyl ketone	MIBK
VOLATILE AROMATIC COMPOUNDS/GCPID	PURGEABLE AROMATICS (PAM)	VAO
Benzene	Benzene	C_6H_6
Ethylbenzene	Ethylbenzene	ETC_6H_5
m-Xylene	meta-Xylene	13DMB
o,p-Xylene	ortho- and/or para-Xylene	XYLEN
Toluene	Toluene	MEC_6H_5
ORGANOCHLORINE PESTICIDES/GCEC		OCP
2,2-Bis (para-chlorophenyl)-1,1-dichloroethane	Dichlorodiphenylethane	PPDDE
2,2-Bis (para-chlorophenyl)-1,1,1-trichloreoethane	Dichlorodiphenyltrichloroethane	PPDDT
Aldrin	Aldrin	ALDRN
Chlordane	Chlordane	CLDAN
Dieldrin	Dieldrin	DLDRN
Endrin	Endrin	ENDRN
Hexachlorocyclopentadiene	Hexachlorocyclopentadiene	CL_6CP
Isodrin	Isodrin	ISODR

APPENDIX 27-UNC-A
CHEMICAL NAMES, METHODS, AND ABBREVIATIONS

Analytes/Methods	Synonymous Names and Abbreviations	Standard Abbreviations
ORGANOPHOSPHOROUS PESTICIDES/GCNPD	ORGANOPHOSPHOROUS COMPOUNDS (OPC)	OPP
Atrazine	Atrazine	ATZ
Malathion	Malathion	MLTHN
Parathion	Parathion	PRTHN
Supona	2-Chloro-1(2,4-dichlorophenyl) vinyldiethyl phosphate	SUPONA
Vapona	Vapona	DDVP
ORGANOPHOSPHOROUS COMPOUNDS/GCFPD	DIMP	OPC
Diisopropylmethyl phosphonate	Diisopropylmethyl phosphonate	DIMP
Dimethylmethyl phosphonate	Dimethylmethyl phosphonate	DMMP
ORGANOSULPHUR COMPOUNDS/GCFPD		OSC
1,4-Oxathiane	1,4-Oxathiane	OXAT
Benzothiazole	Benzothiazole	BTZ
Chlorophenylmethyl sulfide	p-Chlorophenylmethyl sulfide	CPMS
Chlorophenylmethyl sulfone	p-Chlorophenylmethyl sulfone	$CPMSO_2$
Chlorophenylmethyl sulfoxide	p-Chlorophenylmethyl sulfoxide	CPMSO
Dimethyldisulfide	Dimethyldisulfide	DMDS
Dithiane	Dithiane	DITH
METALS/ICP	ICAP	ICP
Cadmium	Cadmium	CD
Chromium	Chromium	CR
Copper	Copper	CU
Lead	Lead	PB
Zinc	Zinc	ZN
SEPARATE ANALYSES		
Arsenic/AA	Arsenic	AS
Mercury/AA	Mercury	HG

APPENDIX 27-UNC-A
CHEMICAL NAMES, METHODS, AND ABBREVIATIONS

Analytes/Methods	Synonymous Names and Abbreviations	Standard Abbreviations
ARMY AGENT DEGRADATION PRODUCTS:		ADP
AGENT PRODUCTS/HPLC	TDGCL	
Chloroacetic Acid	Chloroacetic acid	CLC2A
Thiodiglycol	Thiodiglycol (TDG)	TDGCL
AGENT PRODUCTS/IONCHROM	IMPA	GBDP
Fluoroacetic acid	Fluoroacetic acid	FC2A
Isopropylmethylphosphonic acid	Isopropylmethylphosphonate	IMPA
Methylphosphonic acid	Methylphosphonate	MPA

Methods	Abbreviations
Atomic Absorption Spectroscopy	AA
Gas Chromatography/Conductivity Detector	GCCON
Gas Chromatography/Electron Capture	GCEC
Gas Chromatography/Flame Ionization Detector	GCFID
Gas Chromatography/Flame Photometric	GCFPD
Gas Chromatography/Mass Spectrometry	GCMS
Gas Chromatography/Nitrogen Phosphorous Detector	GCNPD
Gas Chromatography/Photoionizaton Detector	GCPID
High Performance Liquid Chromatography	HPLC
Inductively Coupled Argon Plasma	ICP, ICAP
Ion Chromatography	IONCHROM

APPENDIX 27-UNC-B
PHASE I CHEMICAL DATA

PROJECT NUMBER 85937 0420 PROJECT NAME RMA ONPOST TASK14
FIELD GROUP UN27 PROJECT MANAGER M. WITT
UN27X LAB COORDINATOR PAUL GEISZLER

PARAMETERS	STORET #	SAMPLE ID/# 5162 UN27 1	5163 UN27 2	5164 UN27 3	5165 UN27 4	5166 UN27 5	5167 UN27 6	5168 UN27 7	5169 UN27 8	5170 UN27 9	5171 UN27 10	5172 UN27 11	5173 UN27 12	5174 UN27 13	5175 UN27 14
UNITS	METHOD														
DATE		11/21/85	11/21/85	11/21/85	11/21/85	11/21/85	11/21/85	11/21/85	11/21/85	11/22/85	11/22/85	11/22/85	11/22/85	11/25/85	11/25/85
TIME		09:28	10:06	10:48	11:31	13:39	14:20	14:49	15:46	09:17	09:55	10:47	11:14	08:49	09:22
DDE,PP'	98363	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
UG/G-DRY	0														
1,4 OXATHIANE	98644	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
UG/G-DRY	0														
DIMP	98645	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
UG/G-DRY	0														
VAPONA	98646	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
UG/G -DRY	0														
HEXACHLOROCYCLOPENT-	98647	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
ADIENE UG/G-DRY	0														
MALATHION	98648	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
UG/G-DRY	0														
ISODRIN	98649	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
UG/G-DRY	0														
1,4 DITHIANE	98650	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
UG/G- DRY	0														
DICYCLOPENTADIENE	98651	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
UG/G-DRY	0														
DBCP(NEMAGON)	98652	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
UG/G-DRY	0														
P-CLPHENYLMETHYL-	98653	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
SULFIDE UG/G-DRY	0														
P-CLPHENYLMETHYL-	98654	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
SULFOXIDE UG/G-DRY	0														
ATRAZINE	98655	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
UG/G-DRY	0														
SUPONA	98656	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900
UG/G-DRY.	0														
DMMP	98657	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
UG/G-DRY	0														
PARATHION	98658	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
UG/G-DRY	0														
P-CLPHENYLMETHYL-	98703	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400
SULFONE UG/G-DRY	0														
UNK604	90061	4.35													
UG/G	0														
UNK609	90066	1.09													
UG/G	0														
UNK632	90084	1.09	0.735	0.424	0.662	0.652	0.431	0.646	0.564	0.542	0.671	0.854	0.978	0.752	0.760
UG/G	0														

PROJECT NUMBER 85937 0420
FIELD GROUP UN27
UN27X

PROJECT NAME RMA ONPOST TASK14
PROJECT MANAGER M. WITT
LAB COORDINATOR PAUL GEISZLER

PARAMETERS	UNITS	STORET # / METHOD	SAMPLE ID/# 5162 UN27 1	5163 UN27 2	5164 UN27 3	5165 UN27 4	5166 UN27 5	5167 UN27 6	5168 UN27 7	5169 UN27 8	5170 UN27 9	5171 UN27 10	5172 UN27 11	5173 UN27 12	5174 UN27 13	5175 UN27 14
DATE			11/21/85	11/21/85	11/21/85	11/21/85	11/21/85	11/21/85	11/21/85	11/21/85	11/22/85	11/22/85	11/22/85	11/22/85	11/25/85	11/25/85
TIME			09:28	10:06	10:48	11:31	13:39	14:20	14:49	15:46	09:17	09:55	10:47	11:14	08:49	09:22
UNK573	UG/G	90100 0			0.318		0.326	0.755	0.754	0.677						
UNK574	UG/G	90039 0			0.530		0.543	1.08	1.08	1.02						
UNK628	UG/G	90081 0						0.647		0.564						
UNK614	UG/G	90070 0									0.434					
UNK635	UG/G	90087 0											0.427			
UNK629	UG/G	90082 0													4.29	
UNK650	UG/G	90134 0														
UNK651	UG/G	90110 0														
UNK652	UG/G	90111 0														
UNK633	UG/G	90085 0														
UNK636	UG/G	90088 0														

PROJECT NUMBER 85937 0420 PROJECT NAME RMA ONPOST TASK14
FIELD GROUP UN27 PROJECT MANAGER M. WITT
UN27X LAB COORDINATOR PAUL GEISZLER

PARAMETERS	STORET #	SAMPLE ID/# 5176 UN27 15	5177 UN27 16	5178 UN27 17	5179 UN27 18	5180 UN27 19	5181 UN27 20	5182 UN27 21	5183 UN27 22	5184 UN27 23	5185 UN27 24	5186 UN27 25	5407 UN27 26	5408 UN27 27	5409 UN27 28
UNITS	METHOD														
DATE		11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/26/85	11/26/85	06/03/86	06/03/86	06/03/86
TIME		10:01	10:35	10:59	13:19	13:42	14:13	14:36	15:05	15:39	08:14	08:42	08:44	09:08	09:56
SAMPLE TYPE	71999 0	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO	SO
SAMPLE DEPTH	99758A 0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FT															
SITE TYPE 1	99759 0	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE	BORE
INSTALLATION CODE	99720 0	RK	RK	RK	RK	RK	RK	RK	RK	RK	RK	RK	RK	RK	RK
SAMPLE															
SAMPLING TECHNIQUE	72005 0	S	S	S	S	S	S	S	S	S	S	S	S	S	S
COORDINATE,N/S	98392 0	188322	189324	189317	189307	189298	189293	190292	190302	190311	190315	190323	187863	188048	189300
STP															
COORDINATE,E/W	98393 0	2177510	2177509	2176509	2175504	2174506	2173508	2173502	2174506	2175508	2176504	2177505	2178210	2177971	2178155
STP															
MOISTURE	70320 0	5.3	9.9	6.5	5.2	8.4	8.8	11.1	10.3	8.2	7.6	5.6	3.7	4.8	4.6
%WET WT															
CADMIUM	1028 0	<0.510	<0.510	<0.510	<0.510	<0.510	<0.510	<0.510	<0.510	<0.510	<0.510	<0.510	<0.510	<0.510	<0.510
UG/G- DRY															
CHROMIUM	99584 0	8.57	12.8	15.3	<7.40	<7.40	10.9	10.9	9.93	10.8	<7.40	8.58	<7.40	<7.40	<7.40
UG/G-DRY															
COPPER	1043 0	18.2	21.1	19.7	13.7	6.16	13.7	32.4	13.9	15.6	14.1	12.1	7.07	7.31	7.97
UG/G- DRY															
LEAD	1052 0	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0	<16.0
UG/G-DRY															
ZINC	1093 0	<28.0	42.3	37.5	<28.0	38.8	53.4	65.5	45.0	49.9	33.0	<28.0	<28.0	<28.0	<28.0
UG/G-DRY															
ARSENIC	1003 0	<5.20	<5.20	<5.20	<5.20	<5.20	<5.20	11.5	<5.20	<5.20	<5.20	<5.20	<5.20	<5.20	<5.20
UG/G- DRY															
MERCURY	71921 0	<0.070	<0.070	<0.070	<0.070	<0.070	<0.070	<0.070	<0.070	<0.070	<0.070	<0.070	<0.070	<0.070	<0.070
UG/G-DRY															
ALDRIN	98356 0	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
UG/G- DRY															
DIELDRIN	98365 0	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
UG/G-DRY															
DDT,PP'	98364 0	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
UG/G-DRY															
ENDRIN	98369 0	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00	<4.00
UG/G-DRY.															
CHLORDANE	98361 0	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
UG/G- DRY															

PROJECT NUMBER 85937 0420 PROJECT NAME RMA ONPOST TASK14
FIELD GROUP UN27 PROJECT MANAGER M. WITT
UN27X LAB COORDINATOR PAUL GEISZLER

PARAMETERS	STORET #	SAMPLE ID/# 5176 UN27 15	5177 UN27 16	5178 UN27 17	5179 UN27 18	5180 UN27 19	5181 UN27 20	5182 UN27 21	5183 UN27 22	5184 UN27 23	5185 UN27 24	5186 UN27 25	5407 UN27 26	5408 UN27 27	5409 UN27 28
UNITS	METHOD														
DATE		11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/26/85	11/26/85	06/03/86	06/03/86	06/03/86
TIME		10:01	10:35	10:59	13:19	13:42	14:13	14:36	15:05	15:39	08:14	08:42	08:44	09:08	09:56
DDE,PP'	98363	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
UG/G-DRY	0														
1,4 OXATHIANE	98644	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
UG/G-DRY	0														
DIMP	98645	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
UG/G-DRY	0														
VAPONA	98646	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
UG/G -DRY	0														
HEXACHLOROCYCLOPENT-	98647	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
ADIENE UG/G-DRY	0														
MALATHION	98648	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
UG/G-DRY	0														
ISODRIN	98649	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600	<0.600
UG/G-DRY	0														
1,4 DITHIANE	98650	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
UG/G- DRY	0														
DICYCLOPENTADIENE	98651	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00	<6.00
UG/G-DRY	0														
DBCP(NEMAGON)	98652	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.600	<0.600	<0.600
UG/G-DRY	0														
P-CLPHENYLMETHYL-	98653	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300	<0.300
SULFIDE UG/G-DRY	0														
P-CLPHENYLMETHYL-	98654	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
SULFOXIDE UG/G-DRY	0														
ATRAZINE	98655	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
UG/G-DRY	0														
SUPONA	98656	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900	<0.900
UG/G-DRY.	0														
DMMP	98657	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00
UG/G-DRY	0														
PARATHION	98658	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00	<2.00
UG/G-DRY	0														
P-CLPHENYLMETHYL-	98703	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400	<0.400
SULFONE UG/G-DRY	0														
UNK604	90061														
UG/G	0														
UNK609	90066														
UG/G	0														
UNK632	90084	1.06				0.328	0.548			0.327					
UG/G	0														

PROJECT NUMBER 85937 0420 PROJECT NAME RMA ONPOST TASK14
FIELD GROUP UN27 PROJECT MANAGER M. WITT
UN27X LAB COORDINATOR PAUL GEISZLER

PARAMETERS	UNITS	STORET # METHOD	SAMPLE ID/# 5176 UN27 15	5177 UN27 16	5178 UN27 17	5179 UN27 18	5180 UN27 19	5181 UN27 20	5182 UN27 21	5183 UN27 22	5184 UN27 23	5185 UN27 24	5186 UN27 25	5407 UN27 26	5408 UN27 27	5409 UN27 28
DATE			11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/25/85	11/26/85	11/26/85	06/03/86	06/03/86	06/03/86
TIME			10:01	10:35	10:59	13:19	13:42	14:13	14:36	15:05	15:39	08:14	08:42	08:44	09:08	09:56
UNK573		90100														
	UG/G	0														
UNK574		90039														
	UG/G	0														
UNK628		90081														
	UG/G	0												0.900		
UNK614		90070														
	UG/G	0										0.974				
UNK635		90087														
	UG/G	0								2.23						
UNK629		90082														
	UG/G	0										1.08				
UNK650		90134														
	UG/G	0										0.650				
UNK651		90110														
	UG/G	0										0.866				
UNK652		90111														
	UG/G	0												2.00		
UNK633		90085														
	UG/G	0												0.500		
UNK636		90088														
	UG/G	0														

PROJECT NUMBER 85937 0420 PROJECT NAME RMA ONPOST TASK14
FIELD GROUP UN27 PROJECT MANAGER M. WITT
UN27X LAB COORDINATOR PAUL GEISZLER

SAMPLE ID/#

PARAMETERS	UNITS	STORET #	METHOD	BLK UN27 90	BLK UN27 91	BLK UN27 92	BLK UN27 93
DATE				11/21/85	11/22/85	11/25/85	11/26/85
TIME				00:00	00:00	00:00	00:00
SAMPLE TYPE		71999	0	SO	SO	SO	SO
SAMPLE DEPTH	FT	99758A	0	0.0	0.0	0.0	0.0
SITE TYPE I		99759	0	QCMB	QCMB	QCMB	QCMB
INSTALLATION CODE		99720	0	RK	RK	RK	RK
SAMPLING TECHNIQUE	SAMPLE	72005	0	G	G	G	G
COORDINATE,N/S	STP	98392	0				
COORDINATE,E/W	STP	98393	0				
MOISTURE	%WET WT	70320	0	0.01	0.01	0.01	0.01
CADMIUM	UG/G- DRY	1028	0	<0.510			
CHROMIUM	UG/G-DRY	99584	0	12.4			
COPPER	UG/G- DRY	1043	0	14.4			
LEAD	UG/G-DRY	1052	0	<16.0			
ZINC	UG/G-DRY	1093	0	36.4			
ARSENIC	UG/G- DRY	1003	0	<5.20			
MERCURY	UG/G-DRY	71921	0	NA	NA	NA	NA
ALDRIN	UG/G- DRY	98356	0	<0.500	<0.500	<0.500	<0.500
DIELDRIN	UG/G-DRY	98365	0	<0.600	<0.600	<0.600	<0.600
DDT,PP'	UG/G-DRY	98364	0	<2.00	<2.00	<2.00	<2.00
ENDRIN	UG/G-DRY.	98369	0	<4.00	<4.00	<4.00	<4.00
CHLORDANE	UG/G- DRY	98361	0	<6.00	<6.00	<6.00	<6.00

PROJECT NUMBER 85937 0420 PROJECT NAME RMA ONPOST TASK14
FIELD GROUP UN27 PROJECT MANAGER M. WITT
UN27X LAB COORDINATOR PAUL GEISZLER

SAMPLE ID/#

PARAMETERS	UNITS	STORET # METHOD	BLK UN27 90	BLK UN27 91	BLK UN27 92	BLK UN27 93
DATE			11/21/85	11/22/85	11/25/85	11/26/85
TIME			00:00	00:00	00:00	00:00
DDE,PP'		98363	<0.500	<0.500	<0.500	<0.500
	UG/G-DRY	0				
1,4 OXATHIANE		98644	<0.500	<0.500	<0.500	<0.500
	UG/G-DRY	0				
DIMP		98645	<3.00	<3.00	<3.00	<3.00
	UG/G-DRY	0				
VAPONA		98646	<0.300	<0.300	<0.300	<0.300
	UG/G -DRY	0				
HEXACHLOROCYCLOPENT-		98647	<1.00	<1.00	<1.00	<1.00
ADIENE	UG/G-DRY	0				
MALATHION		98648	<2.00	<2.00	<2.00	<2.00
	UG/G-DRY	0				
ISODRIN		98649	<0.600	<0.600	<0.600	<0.600
	UG/G-DRY	0				
1,4 DITHIANE		98650	<2.00	<2.00	<2.00	<2.00
	UG/G- DRY	0				
DICYCLOPENTADIENE		98651	<6.00	<6.00	<6.00	<6.00
	UG/G-DRY	0				
DBCP(NEMAGON)		98652	<0.005	<0.005	<0.005	
	UG/G-DRY	0				
P-CLPHENYLMETHYL-		98653	<0.300	<0.300	<0.300	<0.300
SULFIDE	UG/G-DRY	0				
P-CLPHENYLMETHYL-		98654	<1.00	<1.00	<1.00	<1.00
SULFOXIDE	UG/G-DRY	0				
ATRAZINE		98655	<0.500	<0.500	<0.500	<0.500
	UG/G-DRY	0				
SUPONA		98656	<0.900	<0.900	<0.900	<0.900
	UG/G-DRY.	0				
DMMP		98657	<3.00	<3.00	<3.00	<3.00
	UG/G-DRY	0				
PARATHION		98658	<2.00	<2.00	<2.00	<2.00
	UG/G-DRY	0				
P-CLPHENYLMETHYL-		98703	<0.400	<0.400	<0.400	<0.400
SULFONE	UG/G-DRY	0				
UNK604		90061				
	UG/G	0				
UNK609		90066				
	UG/G	0				
UNK632		90084				
	UG/G	0				

PROJECT NUMBER 85937 0420
FIELD GROUP UN27
UN27X

PROJECT NAME RMA ONPOST TASK14
PROJECT MANAGER M. WITT
LAB COORDINATOR PAUL GEISZLER

SAMPLE ID/#

PARAMETERS	UNITS	STORET # METHOD	BLK UN27 90	BLK UN27 91	BLK UN27 92	BLK UN27 93
DATE TIME			11/21/85 00:00	11/22/85 00:00	11/25/85 00:00	11/26/85 00:00
UNK573	UG/G	90100 0				
UNK574	UG/G	90039 0				
UNK628	UG/G	90081 0				
UNK614	UG/G	90070 0				
UNK635	UG/G	90087 0				
UNK629	UG/G	90082 0				
UNK650	UG/G	90134 0				
UNK651	UG/G	90110 0				
UNK652	UG/G	90111 0				
UNK633	UG/G	90085 0				
UNK636	UG/G	90088 0				

APPENDIX 27-UNC-C
COMMENTS AND RESPONSES

Shell Oil Company

c/o Holme Roberts & Owen
Suite 1800
1700 Broadway
Denver, CO 80290

June 24, 1987

USATHAMA
Office of the Program Manager
Rocky Mountain Arsenal Contamination Cleanup
ATTN: AMXRM-EE: Chief: Mr. Donald L. Campbell
Bldg E4585, Trailer
Aberdeen Proving Ground, MD 21010-5401

Dear Mr. Campbell:

Enclosed herewith are Shell Oil's comments on the Draft Final Contamination Assessment Reports for sites 19-UNC, 22-UNC, 27-UNC, and 30-1 assessed under Task 14.

Very truly yours,

C. K. Hahn
Manager
Denver Site Project

RDL:ajg

Enclosure

cc: (w/enclosure)
USATHAMA
Office of the Program Manager
Rocky Mountain Arsenal Contamination Cleanup
ATTN: AMXRM-EE: Mr. Kevin T. Blose
Bldg E4585, Trailer
Aberdeen Proving Ground, MD 21010-5401

USATHAMA
Office of the Program Manager
Rocky Mountain Arsenal Contamination Cleanup
ATTN: PMSO: Mr. Brian L. Anderson
Aberdeen Proving Ground, MD 21010-5401

cc: Mr. Thomas Bick
Environmental Enforcement Section
Land & Natural Resources Division
U.S. Department of Justice
P.O. Box 23896
Benjamin Franklin Station
Washington, D.C. 20026

Mr. Scott Isaacson
Headquarters - Department of the Army
ATTN: DAJA-LTS
Washington, D.C. 20310-2210

Ms. Patricia Bohm
Office of Attorney General
CERCLA Litigation Section
1560 Broadway, Suite 250
Denver, CO 80202

Mr. Chris Sutton
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220

Mr. Robert L. Duprey
Director, Air & Waste Management Division
U.S. Environmental Protection Agency, Region VIII
One Denver Place
999 18th Street, Suite 1300
Denver, CO 80202-2413

Mr. Connally Mears
U.S. Environmental Protection Agency, Region VIII
One Denver Place
999 18th Street, Suite 1300
Denver, CO 80202-2413

Mr. Thomas P. Looby
Assistant Director
Colorado Department of Health
4210 East 11th Avenue
Denver, CO 80220

RESPONSES TO SPECIFIC COMMENTS OF SHELL OIL COMPANY ON THE DRAFT FINAL TASK 14 REPORT OF SECTION 27: NONSOURCE AREA

Comment 1: Table 27-UNC-1

Concentration units in Table 27-UNC-1 are M/l not Mg/g.

Response:

The correct units in Table-UNC-1 are ug/liter.

Comment 2: p. 27-UNC-11

The "circular light spots" identified in the aerial photo analysis of this site are suggestive of testing or disposal activities. Interpretations of these features should be provided and/or sampling should be carried out to investigate possible contamination.

Response:

The "circular light spots" are associated with natural variations in vegetative stand types within the section. Field checks of these circular areas revealed them to be mostly low-lying areas where bindweed (Convolvulus arvensis) and cheatgrass (Bromus tectorum) were dominant. Prairie dog activity was also associated with some of these areas. No evidence of disposal activity was found.

Comment 3: p. 27-UNC-18

Shell believes that arsenic values of 25-50 ppm are indicative of contaminated portions of the RMA, not uncontaminated as referenced in the text.

Response:

The Introduction to the Contamination Assessment Report (ESE, 1986) was incorrectly referenced in this report, and the reference has been deleted.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION VIII
999 18th STREET—SUITE 500
DENVER, COLORADO 80202-2405

AUG 2 6 1987

REF: 8HWM-SR

Colonel W. N. Quintrell
Program Manager
AMXRM-EE Department of the Army
U.S. Army Toxic and Hazardous Materials Agency
Building 4460
Aberdeen Proving Ground, MD 21010-5401

Re: Rocky Mountain Arsenal (RMA),
Review of Final Draft CAR for Task 14,
Section 19-UNC, Section 22-UNC, Section
27-UNC, Section 28-UNC

Dear Colonel Quintrell:

EPA Region VIII has reviewed the above referenced final draft reports. We believe that the infonmation available to date indicates that sites "Section 19-UNC, Section 22-UNC, Section 27-UNC, Section 28-UNC " are in need of further evaluation. For these sites, as well as for each of the other RMA sites which may be uncontaminated, additional measures need to be undertaken, as discussed by our technical staffs and noted in my letter of July 24, 1987 on other potentially uncontaminated sites. These measures are:

- Soil sampling results will have to be integrated with ground water data and carefully analyzed during the RI phase.

- An adequate rationale showing the effectiveness of the method of compositing soil samples must be provided. Lacking that, a demonstration must be made that the sampling scheme and other data sets were effective and sufficiently sensitive to support conclusions. Specifically, was the method of compositing soil samples from different depths adequate, how sensitive was the sampling to the stratigraphy or soil horizons, were samples taken from appropriate depths, and were a sufficient number of samples taken? The outcome of the demonstration and analysis could be that further studies are necessary.

- A comparison of the results of the soils/ground water analysis with cleanup levels will have to be made.

These measures are needed before any final decision on a remediation plan, or lack thereof for an uncontaminated site, can be reached. Therefore any conclusion at this time that a site is uncontaminated is premature. We look forward to the receipt and review of plans for accomplishing these additional measures to allow the eventual remediation decision.

In addition, it would expedite analysis if in future reports the control points were plotted on the maps. To ease in the general understanding of the inter-relationships of the several tasks, it would be preferred to have more cross referencing to other task reports. These changes would provide a better understanding of the program and information from each separate report.

Other review comments on the subject Draft CARs are enclosed. Our contact on this matter is Mr. Connally Mears at (303) 293-1528.

Sincerely yours,

Robert L. Duprey, Director
Hazardous Waste Management Division

Enclosures

cc: David Stelton, CDH
Chris Hahn, Shell Oil Company
R. D. Lundahl, Shell Oil Company
Thomas Bick, Department of Justice
Elliott Laws, Department of Justice

RESPONSES TO GENERAL COMMENTS OF U.S. ENVIRONMENTAL PROTECTION AGENCY ON DRAFT FINAL TASK 14 REPORT SECTION 27: NONSOURCE AREA

Comment 1: Soil sampling results will have to be integrated with ground water data and carefully analyzed during the RI phase.

Response: This will be addressed in the Regional Study Area Reports, which are currently in preparation.

Comment 2: An adequate rationale showing the effectiveness of the method of compositing soil samples must be provided. Lacking that, a demonstration must be made that the sampling scheme and other data sets were effective and sufficiently sensitive to support conclusions. Specifically, was the method of compositing soil samples from different depths adequate, were samples taken from appropriate depths, and were a sufficient number of samples taken? The outcome of the demonstration and analysis could be that further studies are necessary.

Response: The Remedial Investigation of the portions of Rocky Mountain Arsenal (RMA) with no history of contamination was designed to maximize the probability of finding undocumented near-surface sources of contamination in these areas. This investigation program includes the review of all pertinent historical documents, interviews with knowledgeable persons, careful examination of aerial photographs spanning the time frame during which the Arsenal was active, and field observations of the area. This program is similar to and in some respects exceeds that typically employed for a CERCLA Preliminary Assessment (PA). This primary program was augmented with a limited soil boring program, the purposes of which were a) to obtain representative samples and analytical results using a standardized grid pattern to better define background soil chemical characteristics and to identify broad scale anomalies, and b) to obtain representative samples and analytical results from locations deemed to have the greatest likelihood of containing contaminants (e.g., surface depressions, ditches, unexplained scars or markings noted on aerial photographs, etc.). This sampling program was conducted even when no evidence of waste disposal or handling activities was found through the PA-type program.

The Phase I investigation which included compositing 0- to 1- and 4- to 5- ft samples, was devised as the most cost effective means to provide a timely contamination assessment of the largely unused portions of RMA. The nonsource area sample collection and preparation

techniques differ only insignificantly from those used for site borings being analyzed for volatiles. An undisturbed soil sample is collected in the field and sent to the lab for analysis for both site borings and nonsource area borings. Sample preparation for a site boring is as follows:

1. The sample is opened and the first 1 inch is discarded.
2. A 1-inch core tube sample is taken from the full length of the sample interval and placed in methanol - this sample is analyzed for volatiles.
3. A 1-inch core tube sample is collected from the full length of the sample interval.
4. The sample core is placed in an amber glass bottle and mixed.
5. The sample is then split and analyzed for semivolatiles and other requested analytes.

Sample preparation for a nonsource area boring is as follows:

1. Sample intervals to be composited, usually 0 to 1 ft and 4 to 5 ft, are opened and the first 1 inch is discarded.
2. A 1-inch core tube sample is collected from the full length of each interval to be composited.
3. Sample cores collected from each interval are placed in an amber glass bottle and mixed. This is the compositing step.
4. The sample is then split and analyzed for semivolatiles and other requested analytes.

The mixing of the samples being composited occurs under the same conditions as the mixing of a site sample being prepared for semivolatile analysis. PMO's nonsource area sample collection and preparation techniques parallel those used by the U.S. Environmental Protection Agency (EPA) at their Superfund sites. Samples to be analyzed for semivolatiles are collected by EPA as disturbed samples, i.e., soil is placed in a glass jar. The sample is then sent to the lab and undergoes the same mixing and splitting procedure identified above for nonsource area samples, except there is no compositing. If any significant concentrations of contaminants existed, the small dilution factor involved in compositing two samples would not mask high concentrations. This procedure offers the advantage of screening two intervals at one time. If contaminants are found in the composite, additional samples for a Phase II study are obtained at both intervals and analyzed separately. It is difficult to determine whether EPA would consider this program "adequate", "appropriate", or "sufficient", since no basis for judgement for these subjective terms was offered. However, this approach to investigate nonsource areas

far exceeds CERCLA and SARA requirements. The extensive document search, interviews, and field reconnaissance, reinforced with additional information from soil borings and an extensive groundwater monitoring network, collectively provide a strong base of evidence that all possible contamination sources have been identified. PMO feels that this program effectively utilized funds available and maintained a schedule to provide timely and sound environmental assessments of the nonsource areas at RMA.

Comment 3: A comparison of the results of the soils/ground water analysis with cleanup levels will have to be made.

Response: This comparison cannot be made at this time, since clean up levels for RMA have not yet been established. After these levels are established, the data collected during the Remedial Investigation will be reviewed, and estimates of potential contamination will be revised.

RESPONSE TO SPECIFIC COMMENTS OF THE U.S. ENVIRONMENTAL PROTECTION AGENCY ON THE DRAFT FINAL TASK 14 REPORT SECTION 27: NONSOURCE AREA

Comment 1:
p. 27-UNC-3

"The presence of these organic constituents in Section 27 ground water does not imply that this site is contributing to contamination in these wells." If the contamination in the ground water is not associated with known surface spills or activities in Section 27, then Task 23 must provide analytical tools to help identify the contamination sources.

Response:

The sources of the ground water contamination will be investigated in the forthcoming Regional Study Area Reports, to be produced after completion of the Phase II program. Migration of contaminants in the ground water beneath the section is currently being monitored under Task 25. These data will be correlated with soil sample analyses and assessed to more accurately determine sources of the contamination.

Comment 2:
p. 27-UNC-7

A diagram locating the circular light spots and soil borings would better facilitate their evaluation.

Response:

The "circular light spots" are associated with natural variations in vegetative stand types and/or associated prairie dog activity. Field checks of these circular areas revealed them to be mostly low-lying areas where bindweed (Convolvulus arvensis) and cheatgrass (Bromus tectorum) are dominant. No evidence of disposal activity was found.

Comment 3:

EPA concurs with Shell's Comment #3: arsenic values of 25-50 ppm are indicative of manmade contamination.

Response:

The Introduction to the Contamination Assessment Report (ESE, 1986) was incorrectly referenced in this report, and the reference has been deleted.

RESPONSES TO SPECIFIC COMMENTS OF THE COLORADO DEPARTMENT OF HEALTH ON THE DRAFT FINAL TASK 14 REPORT SECTION 27: NONSOURCE AREA

No comments were received from the Colorado Department of Health (CDH) prior to the distribution of this report. A period of 6 months was extended to CDH to furnish their comments.